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Notes on the yielding mechanism of flexural members, Oct. 1951

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NOTES ON

The yielding Mechanism of

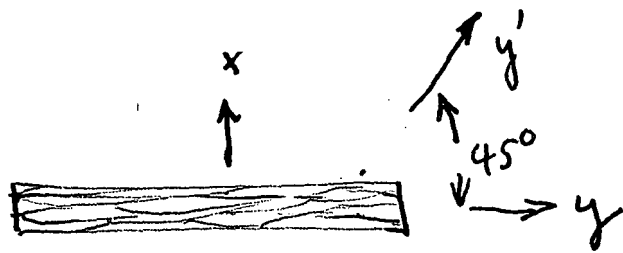
flexural members.

- ① Developing and progressing yield zones in a bend member.
- ② Slip planes (Direction of) in Tension and Compression flanges
- ③ Lower yield strength of comp. flanges. (Same yield strength in Simple and Plastic Comp. test)
- ④ Lower bend strength than the prediction

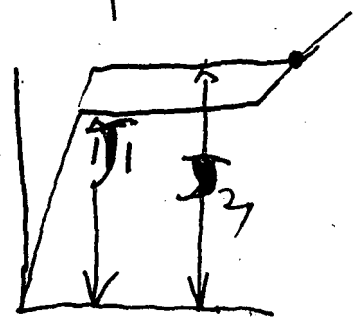
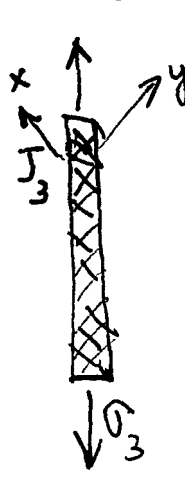
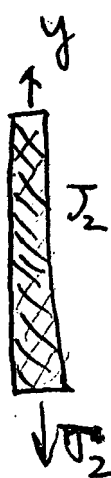
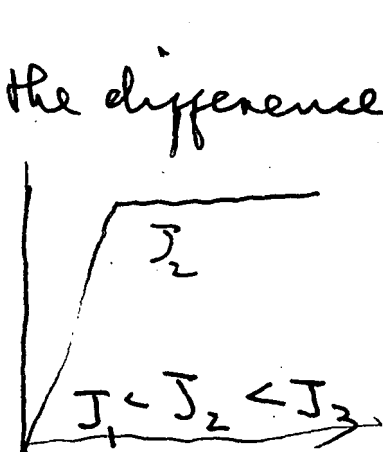
Proposed tests

A series of beam test of rectangular beams of different thicknesses.

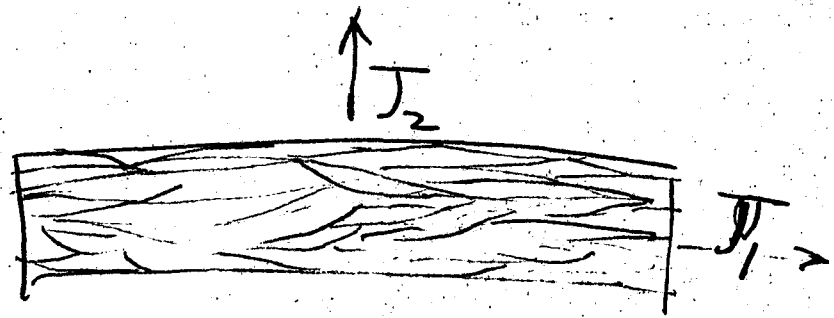
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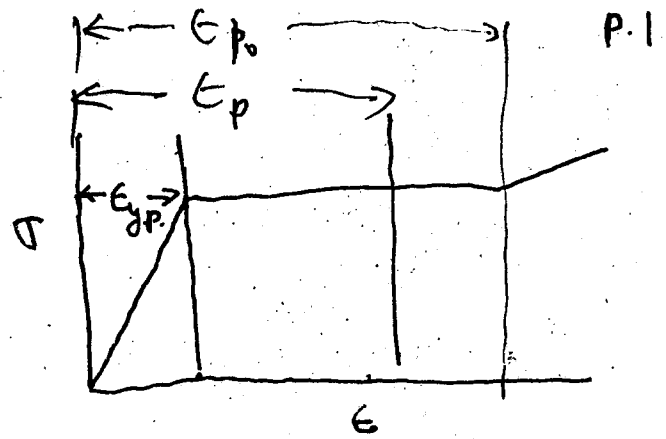
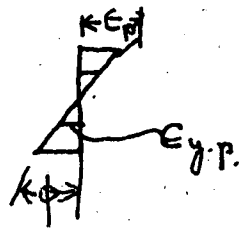
In a rolled section, the grains may be of the above shape. When this is tested in tension or comp. along either x or y direction, the max. shear developed in same sections. They may show the same strength in both directions, But the shearing strength may be different in x & y directions. A tension specimen with white wash, cut along the y' direction may show the difference.



Plastic shear with different yielding strength in two perpendicular directions



$$\tau_2 > \tau_1$$



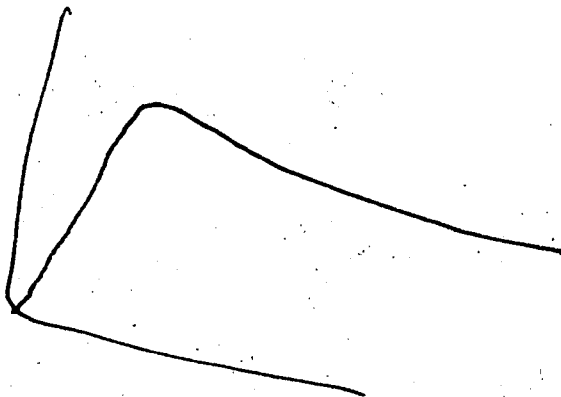
ϵ_p Analytically determined, as function of ϕ .

In actual case ϵ_p is not determined

Plastic strain localized.

This would bring a good point to inelastic buckling problems.

$$\epsilon_{p_0} = 15 \text{ to } 20 \text{ times } \epsilon_{y.p.}$$



Oct. 30, 49

1. Shear always started to flow at the corners.

But this time it does not see failed by combined stress. Because, the flow lines are perpendicular to each other.

2. $M-\phi$ curves plotted by the gages

on web must be compared with the plastic strain on flanges.

3. Plastic strain distribution on a section

might ~~be~~ ~~at~~ change the general idea of inelastic buckling of structural steel

In actual metals there must be ~~a~~
a scale effect of plastic flow.

Either of the following tests would
show some information of this prob.

- ① Different thickness plates bend
in plastic range
- ② Shot column with initial curvature